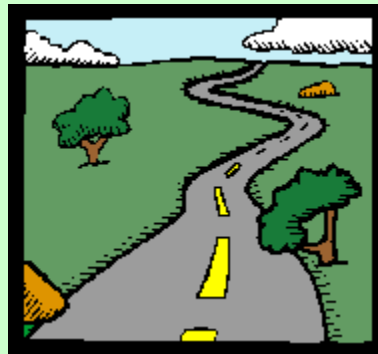


# Hookston Station Site

## The Road to Cleanup

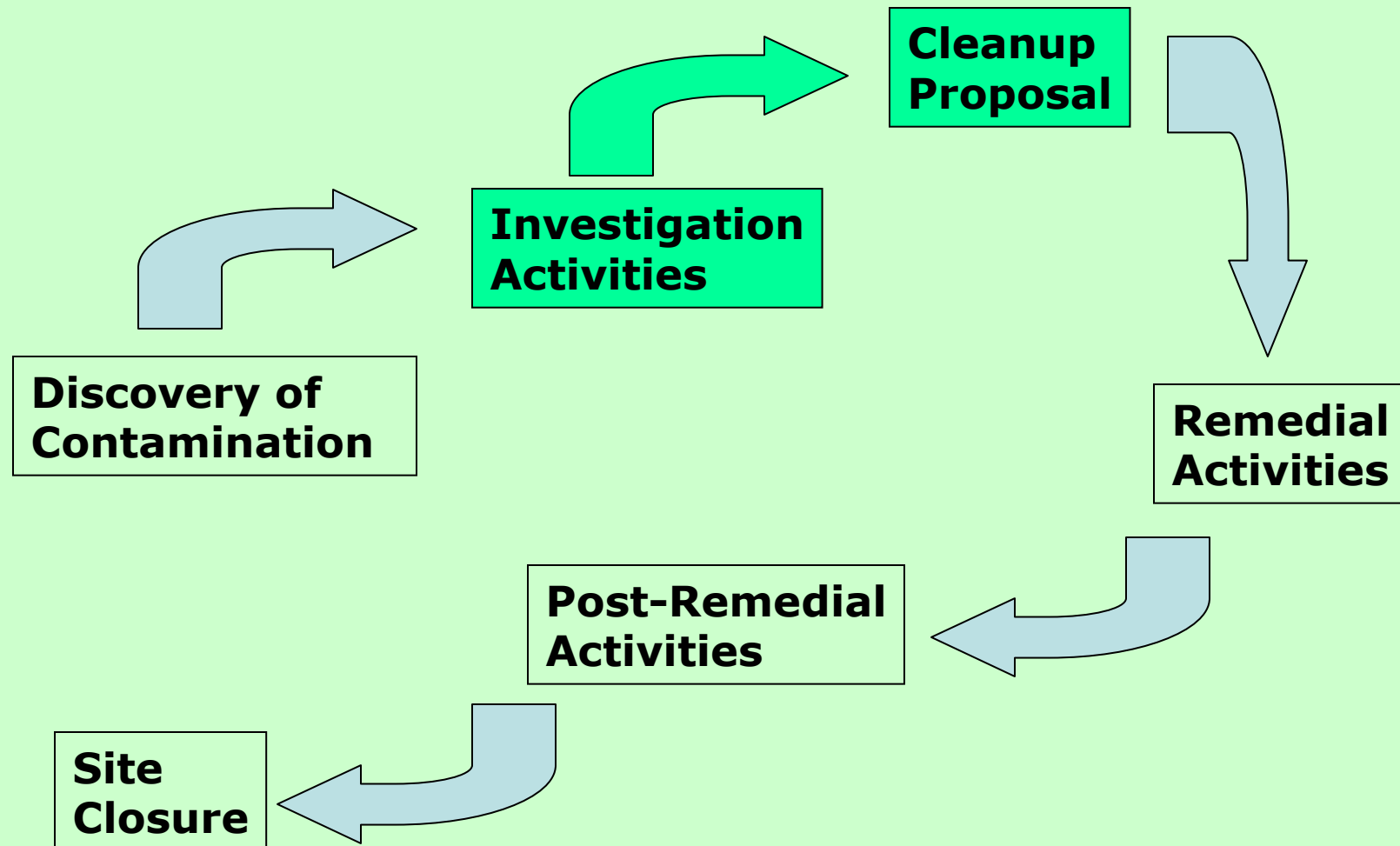


**Mary Rose Cassa, Engineering Geologist  
San Francisco Bay Regional Water Quality Control Board**

# Vicinity Map



# The Cleanup Process



# What Happens Now?

**Feasibility Study is due July 10, 2006**

- **Describe proposed cleanup standards**
- **Describe several applicable technologies**
- **Evaluate options**
- **Recommend cleanup technology, based on several factors**

# **What Happens Now?**

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**Recommendation of cleanup technology is based on several factors**

**– Primary Criteria**

- Overall protection of human health and the environment**
- Compliance with applicable / appropriate standards**

# What Happens Now?

**Recommendation of cleanup technology is based on several factors**

- Other Criteria**
  - Long-term effectiveness and permanence**
  - Reduction of toxicity, mobility or volume**
  - Short-term effectiveness**
  - Implementability**
  - Cost**
  - Community acceptance**

# Community Involvement

- **Learn about cleanup technologies**
- **Review Feasibility Study**
- **Provide comments**

# **Selection of Remedial Technology**

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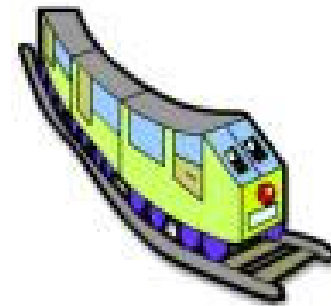
- **Suitability of site**
- **Cost-effective**
- **Meets cleanup goals**



# **Treatment Train:**

## **Multiple technologies over a period of time**

- 1) Inhibit downgradient contaminant migration; protect sensitive receptor**
- 2) Remove large amounts of mass at source area or “hot spot”; reduce the length of time to completion**
- 3) Monitored Natural Attenuation; long-term monitoring**



# **Environmental Concerns to be Addressed in Feasibility Study**

## **From Baseline Risk Assessment**

- **Onsite soil & groundwater**
- **Offsite groundwater**
  - **Indoor air**
  - **Non-drinking water**

# Overview of VOC Cleanup Technologies

- **In-Situ**
  - **Bioremediation**
  - **Chemical Oxidation**
- **Ex-Situ (pump & treat)**
  - **Soil Vapor Extraction (w/Air Sparging)**
  - **Physical/chemical destruction**
  - **Separation**

# Bioremediation

- ***Process:*** Stimulate microorganisms to grow and use the contaminants as food/energy source
- ***Advantage:*** GW not brought to surface
- ***Disadvantage:*** May create more toxic by-products; may stall

# Permeable Barriers

- ***Process:*** GW is directed through a treatment zone – biological or chemical
- ***Advantage:*** GW not brought to surface
- ***Disadvantage:*** Expensive to install; reactive media may need to be replaced

# Chemical Oxidation

- ***Process:*** Strong chemical agents (oxidants) introduced into the subsurface to react with the contaminant of concern
- ***Advantages:*** GW not brought to surface; may be effective over a shorter time frame than bioremediation; more likely to achieve complete destruction
- ***Disadvantages:*** Chemicals require proper handling

# Pump & Treat

- ***Process:*** Conveys contaminated fluids (groundwater and/or soil vapor) to the surface via extraction wells
- ***Advantages:*** Well-established technology; easier to control the treatment
- ***Disadvantages:*** Expensive; requires pumping and material handling; could take a long time to reach cleanup goals

# Soil Vapor Extraction

- ***Process:*** Mechanical blower applies vacuum to well(s); extracted air is treated at the surface
- ***Advantage:*** Could help minimize indoor vapor intrusion
- ***Disadvantage:*** Requires proper site conditions; works best in areas of high concentrations (hot spots)



# Dual-Phase Extraction

- ***Process:*** Conveys soil vapor and liquid (water) from the extraction well(s) to the surface
- ***Advantages:*** May help accelerate cleanup by exposing previously saturated soil to vapor extraction system; not limited by depth of groundwater or flow rate
- ***Disadvantages:*** Requires separate treatment/disposal for water and vapor; requires good site characterization and proper installation

# **Ex-Situ Treatment**

**(the “treat” part of pump & treat)**

- **Physical/Chemical Destruction**
  - E.g., UV Oxidation
  - Chemically converts the contaminant to “harmless” chemicals
  - Cost-effective
  - Rapid
- **Physical/Chemical Separation**
  - E.g., adsorption, ion-exchange
  - Treatment residuals require treatment or disposal; adds to project cost and may require permits

# Operation and Maintenance

- **System O&M included in remediation system design**
  - Groundwater & indoor air monitoring
  - Ensure optimal system performance
  - Track rate of contaminant mass removal
- **O&M also includes**
  - Crawl space ventilation systems
  - Notification to residents regarding cleanup status and risks of private well use

# How Long Will It Take?

Action	Time Frame	Likely Date
Submit FS		July 10, 2006
Approve FS	30 days	August 2006
Adopt Final Site Cleanup Plan	90 days	November 2006
Prepare Remedial Design	30-90 days	December 2006-February 2007
Implement Cleanup		Early 2007

# How Long Will It Take?

- **Short term**: Mitigate immediate threats from vapor intrusion and backyard wells
- **1-10 years**: Address health concerns; reduce groundwater concentrations to avoid potential vapor intrusion
- **10+ years**: Meet all groundwater cleanup standards